



James P. Delton  
Assistant State Engineer

## POLICY AND PROCEDURE DIRECTIVE

TO: ALL MANUAL HOLDERS	PPD NO. 07-1
SUBJECT:  SUBMITTAL AND APPROVAL OF PORTLAND CEMENT CONCRETE MIX DESIGNS	EFFECTIVE DATE:  February 7, 2007

### 1. GENERAL

- 1.1 This Policy and Procedure Directive supersedes P.P.D. No. 03-1.
- 1.2 This Policy and Procedure Directive outlines the procedure to be followed for the submittal and approval of new and previously used Portland cement concrete (P.C.C.) mix designs. A previously used mix design is defined as one that has been used successfully on an ADOT project within the past 24 months and is recorded in the ADOT Concrete Cylinder Report (CCR) program, or one that has been used successfully on a non-ADOT project within the past 24 months.
- 1.3 Approval of mix designs shall not relieve the contractor of full responsibility for the results obtained.

### 2. MATERIALS GROUP RESPONSIBILITIES

- 2.1 The Regional Materials Engineer (RME) will maintain a list of all approved P.C.C. mix designs in the ADOT Concrete Cylinder Report (CCR) program. The RME will also have the responsibility of entering all approved mix designs in the CCR program for review by project personnel and other authorized individuals.
- 2.2 All pre-cast and pre-stressed concrete mix designs must be approved by the Structural Materials Testing Section.

### 3. PROJECT/REGIONAL MATERIALS ENGINEER RESPONSIBILITIES

- 3.1 Figure 1, "PCC Mix Design Submittal and Approval Process", provides the submittal and approval process for both new and previously used mix designs. All mix designs will require approval for the intended use on a project. For previously used mix designs, this will include a check of the intended use as well as a review of the mix history in the CCR program.

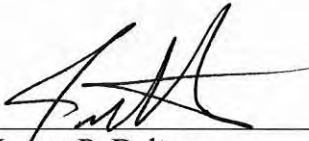
- 3.2 Concrete mix design submittals will be required from the prime contractor for the project records. Qualified subcontractors on the project may use mix designs that have been identified by the prime contractor as proposed for use on the project and approved by the Engineer.
- 3.3 Each new or previously used mix design must include a product code, plant designation, and supplier, along with all data required in Section 1006-3.02 of the Specifications. A single product code may include multiple sources of aggregate, cement, fly ash, natural pozzolan, and silica fume. When multiple sources of material are used under one product code, documentation must be provided which shows equal performance using materials from each source. Multiple sources of material must be listed on the mix design as alternative sources. Mix designs must be prepared under the direct supervision of, and signed by, an individual with one of the following qualifications: a registered professional engineer, a technician with a NICET Level III or higher Concrete Certification, or an ACI Certified Concrete Laboratory Testing Technician Grade II, as required in Figure 1. All must have experience in the design of P.C.C. mix designs. An example of a typical P.C.C. mix design is given in Figure 2.
- 3.4 The minimum over-design requirement for all classes and strengths of concrete shall be established for 28-day compressive strength, unless otherwise specified.
  - 3.4.1 The specified water/cement ratio and minimum cement content for each class and strength of concrete must be adhered to.
  - 3.4.2 For full scale trial batches, the minimum over-design requirement shall be determined in accordance with Chapter 5, Section 5.3, of ACI 318 (Manual of Concrete Practice), excluding Subsections 5.3.3.2 (b), (d), (e), and (f); or by adopting a 20 percent over-design. Full-scale trial batches are defined in Note 2 of Figure 1.
  - 3.4.3 For lab trial batches, the minimum over-design requirement shall be determined in accordance with Chapter 5, Section 5.3, of ACI 318 (Manual of Concrete Practice), excluding Subsections 5.3.3.2 (b), (d), (e), and (f). Lab trial batches are defined in Note 3 of Figure 1.
- 3.5 The following outlines the process that is to be followed for submittal and approval of P.C.C. mix designs:
  - (1) The Resident Engineer receives the mix design submittal from the prime contractor. For mix designs that have previously been used successfully on either ADOT or non-ADOT projects within the past 24 months, the mix design submittal must include supporting test data for the mix design.

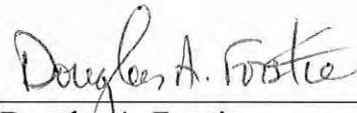
- (2) For both new and previously used mix designs, the Resident Engineer reviews the mix design submittal for accuracy, completeness, and identification/appropriateness of its intended use.
  - (3) Within two working days after receiving the mix design submittal, the Resident Engineer sends a copy to the Regional Materials Engineer.
  - (4) The Regional Materials Engineer reviews the mix design submittal for accuracy and completeness. In addition, the Regional Materials Engineer reviews mix history if available. The Regional Materials Engineer will determine if a trial batch will be required in accordance with Figure 1. When a trial batch is required, it must meet the requirements of Section 3.4. The mix design will be approved only after the receipt of all data, including the test results for compressive strength.
  - (5) The Regional Materials Engineer will approve or disapprove the use of the mix design and notify the Resident Engineer within five working days of receiving all required information, including the trial batch results.
  - (6) The Regional Materials Engineer enters approved mix designs into the CCR program as soon as possible.
- 3.6 For projects within the Phoenix Metropolitan Area, the Resident Engineer may accept a letter listing specific previously approved mix designs that the contractor intends to use on the project. Such a list shall clearly identify the project name and number (including TRACS number), prime contractor, mix design product codes, intended use, supplier, and primary plant and back-up plants. Such letter shall certify that the current plant production of the mix design proposed for the use does not deviate from the previously approved mix design by more than the limits stated in Section 4. Copies of mix designs and current production plant batch weights are not required to be included with the letter.

#### **4. MIX DESIGN DEVIATIONS AND MODIFICATIONS**

- 4.1 Minor deviations from approved mix designs will be allowed. Such deviations are limited to one or more of the following: changes which do not result in mix design batch weight targets for the fine aggregate or the combined coarse aggregates being changed by more than five percent from the originally approved mix design; changes in percentages of coarse aggregate fractions that do not change the total coarse aggregate volume; and changes (within the manufacturer's recommendations) in dosages of chemical or air-entraining admixtures.

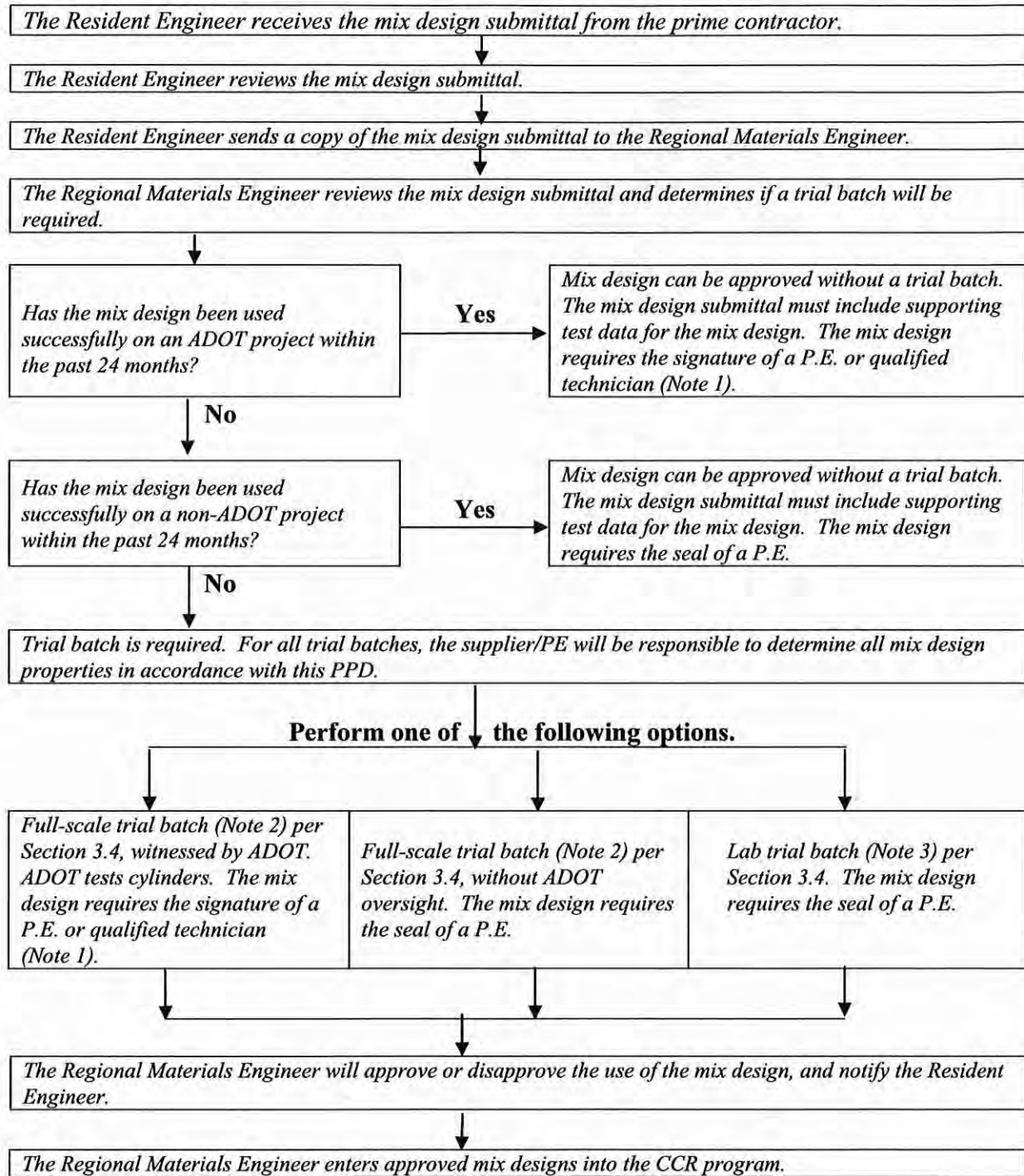
- 4.2 Major modifications to approved mix designs will be made in accordance with Section 3.3 and with the approval of the Regional Materials Engineer and will require the submittal of results from the performance of a trial batch. Major modifications may require a change in the mix design product code. Major modifications include changes in the source of any aggregate; changes in the source of cement, fly ash, or natural pozzolan; changes in the source of silica fume; and changes in the source, brand, or type of chemical or air-entraining admixtures.
- 4.3 All other modifications to approved mix designs will require submittal of a new mix design and product code. This includes changes in the Type of cement; changes in the Class of fly ash or natural pozzolan; changes in the percentage of fly ash, natural pozzolan, or silica fume; changes in the water/cement ratio or the design compressive strength; and other changes not otherwise addressed.

  
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James P. Delton  
Assistant State Engineer  
Materials Group

Approved by: 

  
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Douglas A. Forstie  
Deputy State Engineer  
Highway Operations Group





Note 1: One of the following qualifications: a registered professional engineer, a technician with a NICET Level III or higher Concrete Certification, or an ACI Certified Concrete Laboratory Testing Technician Grade II. All must have experience in the design of P.C.C. mix designs.

Note 2: The materials, mixing equipment, procedures, and size of batch shall be the same as that to be used in production.

Note 3: Proportionally reduced quantities of the materials that are to be used in production, mixed in a portable or laboratory concrete mixer.

**Figure 1. PCC Mix Design Submittal and Approval Process**

SUBMITTAL AND APPROVAL OF  
PORTLAND CEMENT CONCRETE  
MIX DESIGNS



**Arizona Materials**  
3636 S. 43rd Ave.  
Phoenix Az. 85009  
602-278-4444 Office  
602-442-7272 Fax

**READY MIX CONCRETE MIX DESIGN**

DATE: November 28, 2006  
PRODUCT CODE: 14530  
PRODUCT DESCRIPTION: State Class S 4500  
PROJECT NAME: Red Mountain Freeway - University to Southern  
PROJECT NUMBER: ADOT # STP-202-B-(002)B  
PROJECT LOCATION: TRACS # H678301C  
PLANTS: AZ Materials, 3410 E. Virginia Mesa

MAX AGG: 1" ROCK / SAND 59 / 41

		WEIGHT	VOLUME	S.G.
CEMENT ASTM C-150 Type I/II/IV	lbs	540.00	2.75	3.15
FLY ASH ASTM C-618 Type F	lbs	110.00	0.83	2.13
CONCRETE SAND	lbs	1262.00	7.87	2.67
1" CONCRETE ROCK	lbs	945.00	5.69	2.66
1/2" CONCRETE ROCK	lbs	707.00	4.28	2.66
3/8" CONCRETE ROCK	lbs	130.00	0.80	2.60
FINE SAND	lbs	0.00	0.00	2.60
WATER ADDED IN MIX	lbs	300.00	4.81	1.00
WATER REDUCER POZZ 80	ozs	24		
MICRO AIR	ozs			
MIDRANGE WR POLYHEED 997	ozs			
SUPER P POZZ 400N	ozs			
<b>TOTALS</b>		<b>3994.00</b>	<b>27.00</b>	

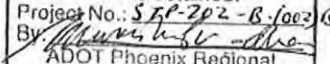
SLUMP: 4" +/- 1" W/C 0.46

CEMENT ASTM C-150 TYPE II LOW ALKALI Lehigh Southwest Portland Cement (Tehachapi CA)  
FLYASH ASTM C-618 CLASS F Phoenix Cement (Cholla Power Plant)  
AGGREGATE - FINE & COARSE C-33 Vulcan Materials, Val Vista Pit  
AGGREGATE - FINE & COARSE C-33 Vulcan Materials, Val Vista Pit  
ADMIX ASTM C-494 Master Builders

PLEASE ORDER BY PRODUCT CODE

14530

  
Steve Clark, QC Manager - Arizona Materials

Approval of this mix design shall not relieve the contractor of full responsibility for the results obtained.  
Project No.: STP-202-B-002B  
By:   
ADOT Phoenix Regional Materials Engineer  
Date: 1/6/06

**Figure 2. Example of a Typical Portland Cement Concrete Mix Design**